ATTACHMENT

LAWRENCE LIVERMORE LABORATORY

ENCLOSURE 2

Selected Operating Reactor Issues Program II

Reactor Coolant System Vents (NUREG-00737, Item II.B.1.)
NRC FIN A0250 - Project 9.

FINAL TECHNICAL EVALUATION REPORT FOR GINNA

Docket Number 50-244
NRC TAC Numbers 44376

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NOTICE

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TECHNICAL EVALUATION REPORT
ON REACTOR COOLANT SYSTEM VENTS
FOR GINNA

INTRODUCTION

The requirements for reactor coolant system high point vents are stated in paragraph (c)(3)(iii) of 10 CFR 50.44, "Standards for Combustible Gas Control System in Light Water Cooled Power Reactors," and further described in Standard Review Plan (SRP) Section 5.4.12, "Reactor Coolant System High Point Vents," and Item II.B.1 of NUREG-0737, "Clarification of TMI Action Plan Requirements." In response to these and previous requirements, the Rochester Gas and Electric Corporation has submitted information in References 1 through 5 in support of the vent system at the R.E. Ginna Nuclear Power Plant.

EVALUATION

The function of the high point vent system is to vent noncondensible gases from the high points of the reactor coolant system (RCS) to assure that core cooling during natural circulation will not be inhibited. The Ginna reactor vessel head vent system (RVHVS) provides venting capability from the reactor vessel head while the pressurizer can be vented through the existing power operated relief valves (PORVs). The noncondensible gases, steam, and/or liquids vented from the reactor vessel head are piped and discharged directly to the refueling cavity and the discharges from the pressurizer are piped to the pressurizer relief tank. The RVHVS is designed to vent a volume of gas at least equal to one half of the RCS volume in one hour. Flow restriction orifices in the RVHVS paths, however, limit the flow from a pipe rupture or from inadvertent actuation of the vent system to less than the capability of the reactor coolant makeup system. Hence, the licensee's compliance with 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors," is not affected by the addition of the RVHVS.

The RVHVS consists of two redundant vent paths from the reactor vessel head to the refueling cavity, each containing two solenoid-operated valves in series which are remotely controlled from the main control room. Indication of valve position is provided in the main control room by way of reed switches. A degree of redundancy has been provided by powering each RVHVS vent path from a separate emergency bus, to ensure that RCS venting capability from the reactor vessel head is maintained. RVHVS valve seat leakage is detected, together with other unidentified RCS leakage, by way of containment radiation and sump level monitoring in accordance with plant technical specifications. The PORVs, used to vent the pressurizer, function as a part of the automatic reactor coolant system pressure control system, but can additionally be manually controlled from the main control room. The PORVs and block valves receive power from emergency buses and have positive valve position indication in the main control room.

The portion of each RVHVS path up to and including the second normally closed valve forms a part of the reactor coolant pressure boundary and thus must meet reactor coolant pressure boundary requirements. The licensee has stated that the new piping added between previously existing piping and the flow restriction orifices is ASME Section III Class I and the system beyond the orifices to the second vent valves is ASME Section III Class II, in compliance with 10 CFR 50.55a and Regulatory Guide 1.26. The entire RVHVS is designated Seismic Category I in compliance with Regulatory Guide 1.29. The RVHVS is designed for pressures and temperatures corresponding to the RCS design pressure and temperature. In addition, the vent system materials are compatible with the reactor coolant chemistry and were fabricated and tested in accordance with ASME Section III subsections NB, NC, and NF and plant specifications. The RVHVS and the pressurizer PORV vent system are also acceptably separated and protected from missiles and the dynamic effects of postulated piping ruptures. We therefore conclude that the design of the portions of the RVHVS up to and including the second normally closed valve conforms to all reactor coolant pressure boundary requirements, including 10 CFR 50.55a and the applicable portions of General Design Criteria 1, 2, 4, 14, 30, and 31. The licensee has further ascertained that the essential operation of other safety-related systems will not be impaired by postulated failures of RVHVS components.

We have reviewed the licensee's RVHVS design to assure an acceptably low probability exists for inadvertent or irreversible actuation of the vent system. Each vent path has two solenoid-operated globe valves in series, and each valve has a separate key locked control switch. Power is removed from the valves during normal reactor operation. The valves are powered by emergency power supplies and fail to the closed position in the event of loss of power. The licensee has stated that the controls and displays added to the main control room for the vent system will be considered in a human factors analysis conducted in accordance with NUREG-0737 Item I.D.1, "Control-Room Design Reviews." We therefore find that no single active component failure or human error should result in inadvertent opening or failure to close after intentional opening of the RVHVS. However, reactor vessel head vent valve position indication is powered from the same power supply which supplies control power. If the licensee's intention is to remove control power by opening the breakers or removing the fuses rather than locking out power to the valves by the key-lock switches, positive valve position indication will be lost. Until the licensee verifies that the control power breakers will not be maintained open and the fuses will not be removed during normal operation or the licensee provides an acceptable alternative method of continuous, direct valve position indication, this is an open item.

We have also examined the locations where the RVHVS normally discharges to the containment atmosphere in the vicinity of the refueling cavity. Based on a description provided by the licensee (Reference 3), these locations are in areas that assure good mixing with the containment atmosphere to prevent the accumulation or pocketing of high concentrations of hydrogen in compliance with 10 CFR 50.44, "Standards for Combustible Gas Control System in Light Water Cooled Power Reactors." Additionally, these locations are such that the operation of safety-related systems would not be adversely affected by the discharge of the anticipated mixtures of steam, liquids, and noncondensible gases.

The licensee has stated that the RVHVS valves will be exercised each refueling outage, and proper valve position will be visually verified. Operability testing of the PORVs and block valves is specified in the Ginna Inservice Pump and Valve Testing Program and is in accordance with Section XI of the ASME Code.

CONCLUSION

We conclude that the Ginna RVHVS and pressurizer PORV vent system design is sufficient to effectively vent noncondensible gases from the reactor coolant system without leading to an unacceptable increase in the probability of a LOCA or a challenge to containment integrity, meets the design requirements of NUREG-0737 Item II.B.1 and the applicable portions of General Design Criteria 1, 2, 4, 14, 30, and 31, and conforms to the requirements of paragraph (c)(3)(iii) of 10 CFR 50.44 with one exception concerning positive valve position indication as noted above. We therefore recommend following resolution of this open item that the Ginna RCS vent system design be found acceptable. It should be noted, however, that the following items were excluded from the scope of our review: seismic and environmental qualification of the RVHVS, RVHVS operating guidelines and procedures, and required modifications to the plant technical specifications and in-service inspection program for the RVHVS.

REFERENCES

1. Letter, L.D. White, Jr. (Rochester Gas and Electric Corporation) to D. L. Ziemann (NRC), "Followup Actions Resulting from the NRC Staff Reviews Regarding the Three Mile Island Unit 2 Accident, R.E. Ginna Nuclear Power Plant, Docket No. 50-244," dated October 17, 1979.

2. Letter, L.D. White, Jr. (Rochester Gas and Electric Corporation) to D. Ziemann (NRC), "Three Mile Island Lessons Learned Short Term Requirements, R.E. Ginna Nuclear Power Plant, Docket No. 50-244," dated December 28, 1979.

3. Letter, L.D. White, Jr. (Rochester Gas and Electric Corporation) to D.M. Crutchfield (NRC), "Short Term Lessons Learned, Reactor Coolant System Venting, R.E. Ginna Nuclear Power Plant, Docket No. 50-244," dated June 2, 1980.

4. Letter, J.E. Maier (Rochester Gas and Electric Corporation) to D.M. Crutchfield (NRC), "NUREG 0737 Requirements, R.E. Ginna Nuclear Power Plant, Docket No. 50-244," dated July 1, 1981.

5. Letter, J.E. Maier (Rochester Gas and Electric Corporation) to D.M. Crutchfield (NRC), "Reactor Coolant System Vents (TMI Item II.B.1), R.E. Ginna Nuclear Power Plant, Docket No. 50-244," dated May 7, 1982.